

**REMARKS****Summary of the Office Action**

The Office Action alleges that the title is “not descriptive” and thus requires a new title. The drawings are objected to because Figs. 1 and 2 must allegedly each be labeled as “Prior Art.” Claims 1, 2, 5 and 6 stand rejected under 35 U.S.C. § 102(b) as allegedly being clearly anticipated by U.S. Patent No. 2,841,049 to Scott (hereinafter “Scott”). Claims 3, 4, 7 and 8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Scott.

**Summary of the Response to the Office Action**

Applicants have canceled claims 1 and 5 without prejudice or disclaimer. Applicants have added new claims 9 and 10 and amended claims 2, 3, 6 and 7 to differently describe the invention. Accordingly, claims 2-4 and 6-10 are now pending. The title has been amended. A Submission of Replacement Drawing Sheets is attached.

**Requirement for a new Title**

The Office Action alleges that the title is “not descriptive” and thus requires a new title. In response, Applicants have amended the title in accordance with the Office Action’s requirement. Accordingly, withdrawal of the requirement for a new title is respectfully requested.

**Objections to the Drawings**

The drawings are objected to because Fig. 1 and 2 should allegedly each be designated by a legend such as “Prior Art.” In a Submission of Replacement Drawing Sheets filed concurrently herewith, Applicants propose to amend the drawings by labeling Figs. 1 and 2 as “Prior Art.” Accordingly, Applicants respectfully request that the objection to the drawings be withdrawn.

**Rejections under 35 U.S.C. § 102(a) and U.S.C. 103(a)**

Claims 1, 2, 5, and 6 stand rejected under 35 U.S.C. § 102(a) as being clearly anticipated by Scott. Claims 3, 4, 7 and 8 are rejected under U.S.C. § 103(a) as being unpatentable over Scott. Independent claims 1 and 5 have been canceled without prejudice or disclaimer. Accordingly, the rejections of these claims have been rendered moot. Applicants have added new independent claims 9 and 10 to differently describe the invention. Moreover, the prior dependent claims have been amended to be dependent upon newly-added independent claims 9 or 10. To the extent that the rejections under 35 U.S.C. §§ 102(a) or 103(a) might be applied to the currently pending claims, they are respectfully traversed for at least the following reasons.

The Office Action refers to optical element 15 as meeting the limitations of recited “object” of original claim 1 that includes back-to-back reflective surfaces. Also, the Office Action cites to mirrors 12, 14, 16 and 17 as meeting the recited “opposing incident optical system” of original claim 1.

Even assuming, strictly arguendo, that such interpretations might be taken as correct, Applicants respectfully submit that Scott does not teach or suggest, to any extent, a photodetector for receiving the interfered light to generate a beat signal as the difference of optical frequencies

by heterodyne detection, as recited in the newly-added claim 9. Moreover, Scott does not teach or suggest, to any extent, a measuring circuit connected to the photodetector for calculating the amount of travel of the object, as also recited in newly-added claim 9. Similar assertions are also made for the applicable method steps of newly-added claim 10.

Applicants respectfully submit that Scott merely discloses an interferometer that improves on the previous Michelson type interferometer discussed in the background portion of Scott. In general, various interference fringes result when the mirrors of the Scott or Michelson type interferometers are not situated in a parallel arrangement. Changing the orientation of the mirrors (11, 12, 14, 15, 16 and 17) in these types of interferometers can produce straight, circular, elliptical, parabolic, or hyperbolic fringes. Reference number 19 in Scott points to such circular fringe patterns. See, for example, col. 3 lines 3-8, and Fig. 1 of Scott. Applicants respectfully submit that in such interferometers, observation of resultant fringe patterns is necessary. The problem to be solved in Scott, as discussed at col. 1, lines 3-8, results when the two reflective surfaces (mirrors) tilt out of perfect parallelism with respect to each other.

The present application is directed to a laser-based measuring apparatus and methodology for measuring an amount of travel of an object to which incident measuring light beams are opposed. However, the present application is not directed to any arrangement or methodology that requires observation of resultant fringe patterns, as disclosed in Scott. The measuring apparatus of the present invention is not merely an interferometer as in Scott. On the other hand, embodiments of the present invention aim to provide a laser measuring apparatus and methodology capable of optically doubling the measurement resolution in a simple optical configuration, irrespective of which specific types of interferometers and reflectors are used.

Moreover, Applicants respectfully submit that Scott does not provide any motivation or suggestion for an artisan to add a photodetector receiving interfered light to generate a beat signal as the difference of optical frequencies by heterodyne detection, or a measuring circuit connected to the photodetector for calculating the amount of travel of the object on the basis of the beat signal, in the manner recited in each of newly-added independent claims 9 and 10 of the instant application.

Even further, Applicants respectfully submit that there is no disclosure in Scott of heterodyning accomplished by mixing the forward and backward light beam frequencies, the latter being modulated by the moving object, in the two optical paths, in the manner recited in newly-added independent claims 9 and 10. In contrast to any disclosure of Scott, the apparatus and methodology according to embodiments of the present invention differentially measure complementary two relative displacements of the moving object from the beam splitter to the back-to-back reflectors in the two optical paths by using the photodetector and the electrical circuits. Applicants do not admit to any extent that such heterodyne detection arrangements or methodologies are admitted prior art.

Accordingly, Applicants respectfully assert that the rejections under 35 U.S.C. §§ 102(b) and 103(a) should be withdrawn because Scott does not teach or suggest each feature of newly-added independent claims 9 and 10. As pointed out in MPEP § 2131, "[t]o anticipate a claim, the reference must teach every element of the claim." Thus, "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. Verdegaal Bros. v. Union Oil Co. Of California, 2 USPQ 2d 1051, 1053 (Fed. Cir. 1987)." Similarly, MPEP § 2143.03 instructs that "[t]o establish prima facie

obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In re Royka, 409 F.2d 981, 180 USPQ 580 (CCPA 1974)." Furthermore, Applicants respectfully assert that dependent claims 2-4, and 6-8 have been amended to be dependent on newly-added independent claims 9 and 10, respectively, and thus are allowable at least because of the dependence from their respective independent claims and the reasons set forth above. Moreover, Applicants do not concede to the Office Action's allegation that the application of concepts associated with embodiments of the instant invention, as recited, for example, in dependent claims 3 and 7 would have been obvious. As discussed, for example, at lines 1-4 of page 6, typical interferometers of the related art cannot be used when a small measuring reflective plane is measured due to a limited space, or when a measuring reflective plane is not plane, such as a cylindrical, spherical and the like.

### **CONCLUSION**

In view of the foregoing, Applicants respectfully request reconsideration and the timely allowance of the pending claims. Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Applicants' undersigned representative to expedite prosecution.

**EXCEPT** for issue fees payable under 37 C.F.R. § 1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. §§ 1.16 and 1.17 which may be required,

including any required extension of time fees, or credit any overpayment to Deposit Account

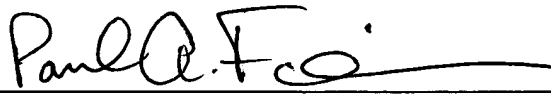
50-0310. This paragraph is intended to be a **CONSTRUCTIVE PETITION FOR  
EXTENSION OF TIME** in accordance with 37 C.F.R. § 1.136(a)(3).

Respectfully submitted,

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